Title: Coming Out of My Shell

Brief Overview:

The molting of Callinectes Sapidus, commonly known as the Blue Crab, is affected by various factors. One factor, salinity, changes by varying degrees from season to season. As part of a science project, experimental floats could be set up and monitored over an extended time period in order to test the effects of salinity on molting in Callinectes Sapidus.

Links to NCTM 2000 Standards:

- **Mathematics as Communication**
  Students will use collected data to sketch an appropriate graph of their results and form a conclusion based on this information.

- **Mathematics as Connections**
  Students will show the mathematical correlation between salinity levels and molting rates in hard shell blue crabs.

- **Mathematics as Representation**
  Students will display their results via selected types of graphs.

Links to Maryland High School Mathematics Core Learning Goals:

Functions and Algebra

- **1.1.2**
  Students will demonstrate the ability to investigate, interpret, and communicate solutions to mathematical and real-world problems using patterns, functions, and algebra. They will represent patterns and functional relationships in a table, as a graph, and/or by mathematical expression.

Data Analysis and Probability

- **3.1**
  Students will collect, organize, analyze, and present data.

Links to National Science Education Standards:

- **Science as Inquiry**
  Students will research the life cycle of an organism that has economical and social ramifications.

- **Life Science**
  Students will test biotic factors that affect the life cycle of Blue Crabs.

- **Science in Personal and Social Perspectives**
  Students will investigate the interdependence of nature and human economics.

Links to Maryland High School Science Core Learning Goals:

- **Skills and Processes**
  Students will demonstrate ways of thinking and acting inherent in the practice of science. They will use the language and instruments of science to collect, organize, interpret, calculate, and communicate information.

Students will pose scientific questions and suggest experimental approaches to provide answers to questions. (Goal 1.2)

Students will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately. (Goal 1.3)

Students will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication. (Goal 1.4)

- **Concepts of Biology**
  Students will demonstrate the ability to use scientific skills and processes and major biological concepts to explain the uniqueness and interdependence of living organisms, their interaction with the environment, and the continuation of life on earth.

  Students will investigate the interdependence of diverse living organisms and their interactions with the components of the biosphere. (Goal 3.5)

Grade/Level:

Grades 10-12

Duration/Length:

For duration of Science Fair Project (approx. 8 weeks)

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Format for lab write-ups and science fair projects
- Graphing

Student Outcomes:

Students will:

- compare tested results to historical environmental accounts.
- use scientific test kits.
- describe the life cycle of Callinectes Sapidus.

Materials/Resources/Printed Materials:

- Watertight crab floats
- Water pump
- Water heaters
- Salt
- Salinity test kits
- Crab food

Development/Procedures:

- Research the life cycle of the Blue Crab with the students. Include what signs to look for in a molting crab, e.g., color change, duration, conditions, etc.
- Construct or purchase five watertight crab floats. (The floats can be made with large low sided plastic tubs as opposed to the traditional wooden floats.)

- Set up floats with salinities of 5 parts per thousand (ppt), 10ppt, 20ppt, 30ppt, and 40ppt.
- Maintain a water temperature of about 24 degrees Celsius.
- Place about 10 crabs per float.
- Make daily observations of the crabs and use your research information to alert students of any premolting signs. Have students make observations in their lab books.
- Have students record data on a calendar chart so that they can compare results of the various floats.
- When the experiment is completed, have students write a report to include observations, data, graphs, analysis, and conclusions.

Assessment:

- Check for accurate observations that are recorded in student lab books.
- Give students credit for maintaining functioning floats.
- Attach some type of point system for obtaining a successful molting. (This will encourage students to redesign the procedures or experiment, if necessary, by changing such controls as temperature, amounts of light,etc.
- Evaluate the final lab write-up of the crab molting experiment.

Extension/Follow Up:

- Choose a different variable that may affect the molting rate of crabs and develop an experiment to test that variable.
- Compare regions in the Chesapeake Bay with varying salinity levels with the corresponding amounts of harvested crabs from those regions.

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